**Problem Solving Activities**

The Wolf, the Goat, and the Cabbage

A rural man returns from the market where he bought a wolf, a goat and a cabbage. To get home, he must cross a broad river in a rowboat. The boat is very small, unfortunately, and the poor man has room in the boat for only one of these organisms at a time. What's worse, he cannot leave the wolf and the goat on the same bank, whether coming or going, for the wolf will surely eat the goat. Nor can he leave the goat and cabbage on the same bank because the goat will eat the cabbage. Is the feat even possible? If so, how does the man manage it?

http://www.mathcats.com/explore/river/crossing.html

## Halloween Challenge

You are attending a Halloween party, and you're bringing some pretty scary guests: a vampire, a witch, a goblin. You're also bringing a pumpkin. Along the way, you must cross a river. There is a small boat available, but it's only large enough to carry you, the pumpkin, and one of your guests. You can't leave the goblin with the pumpkin (he'll eat it). You can't leave the witch with the goblin (she'll cast a spell on him). And you certainly can't leave the vampire with the witch (he'll drink her blood). Despite these restrictions, it's still possible to cross the river. You will need to make several trips, bringing one of your guests across, and sometimes bringing one back. Figure out how to ferry your guests across the river without any unfortunate mishaps. Tell me who is in the boat (with you) each trip, and who is on each shore. You should work with a partner ... this problem is too scary to do alone!!

# Crossing the Bridge

Four friends need to cross a bridge. It is night and they have just one lamp. People that cross the bridge must carry the lamp to see the way. Unfortunately, not more than two persons can go on the bridge at one time, moving at the speed of the slower one. Rachel takes 1 minute to cross, Ben takes 2 minutes to cross, George takes 7 minutes to cross, and Yvonne takes 10 minutes to cross. Can you find out the fastest time for all four people to cross the bridge?

http://nrich.maths.org/public/viewer.php?obj\_id=5916

Strive for 65

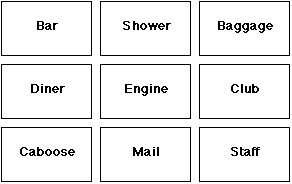
On some highways the speed limit is 65 miles per hour. Many people retire when they're 65 years old. And 65 is the magic number in this puzzle. Pick one number from each column in the table below. Make sure no two numbers are in the same row. When you add up the five numbers you picked, the sum will always equal 65.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 |

For example, you might pick the numbers 1, 10, 12, 19, and 23. Their sum is 65! Your assignment is to explain why this happens. Your explanation should be clear enough so that anyone who reads it will easily understand why this always works. HINT: why is it so important that no two numbers you pick be in the same row or column?

David Copperfield's Orient Express

The following 9 cards represent nine cars on the Orient Express. You may start in the Shower, Diner, Club, or Mail cars. You may move one step up, down, left, or right. You may not move diagonally.

Step #1: Make four moves. You couldn't be in the Staff car, so remove it.

Step #2: Make five moves. You couldn't be in the Club car, so remove it.

Step #3: Make two moves. You couldn't be in the Mail car, so remove it.

Step #4: Make three moves. You couldn't be in the Baggage or Caboose cars, so remove them.

Step #5: Make three moves. Since many of you just left the Shower car, remove it.

Step #6: Make one move. You are in the diner car.

Your assignment is to explain why this magic trick works. Some suggestions: Number the cards (Bar = 1, Shower = 2, Baggage = 3, ... ). Which numbers can you start on? What do these numbers have in common? Do the trick several times, recording the numbers of the cars you visit, and the ones you remove. How can David Copperfield be sure you're not in the cars he tells you to remove? Write an explanation of how this magic trick works. Make your explanation clear enough that anyone could read it and understand how this magic trick works.

Four Fours

Using exactly four fours, write expressions equal to each of the numbers from 0 to 25. You may use the addition, subtraction, multiplication, division, square root, and factorial operators. You may combine fours such as .4, .4 repeating, 44, and 444. Make sure you are using the correct order of operations. You may only use parentheses when they are needed. The first few numbers are done for you as examples.

|  |  |
| --- | --- |
| 0 = 44 - 44 | 13 = |
| 1 = 44 ÷ 44 | 14 = |
| 2 = 4 ÷ 4 + 4 ÷ 4 | 15 = |
| 3 = | 16 = |
| 4 = | 17 = |
| 5 = | 18 = |
| 6 = | 19 = |
| 7 = | 20 = |
| 8 = | 21 = |
| 9 = | 22 = |
| 10 = | 23 = |
| 11 = | 24 = |
| 12 = | 25 = |